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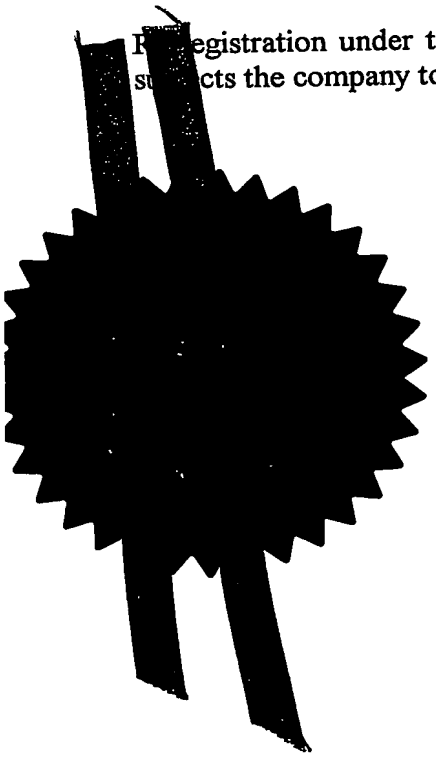

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Patents ADP number *(if you know it)*

1867002

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UNITED KINGDOM

4. Title of the invention

DIMENSION-BASED TARIFFING

5. Name of your agent *(if you have one)*

LLOYD, Barry George William

"Address for Service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

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DUPLICATE

TARIFF MODELLING

This invention relates to product or service pricing and, in particular, to a method and apparatus for modelling tariffs for use in determining a price or a yield for a product or service. The present invention finds particular application in billing for telecommunications-related products and services, but may also be applied to financial and other products, for example to model interest rates and other investment yields. More generally, the modelling technique of the present invention may also be applied to any complex technical system for which rates are to be modelled and in which an output is to be calculated on the basis of one or more variable inputs and an applicable set of rates identified from a respective model.

There are a number of known methods for modelling tariffs in billing systems. Typical of these methods, in the telecommunications field in particular, are those used in the *arbor*® billing platform and in Convergys'® Geneva billing software. However, whilst these systems provide a basic tariff model, each system was designed primarily for use with products comprising a relatively small number of different tariffs, for example voice telephony products for which the price to be charged is largely dependent upon the use made of the product at a relatively small number of different charging rates, e.g. a local call rate, a national call rate, a rate for calls to mobile telephones and a rate for "premium rate" calls.

Consider an example of a voice telephony product for which the price for making a telephone call is a function not only of the duration of the call but also of the distance, rounded up to the nearest kilometre, between the calling party and the respective called party. To define the charging rate to be applied in calculating the price of calls, prior art tariff models would require a different tariff to be defined for every discrete distance measure from 1 kilometre (km) up to the maximum distance likely to occur. Each tariff would define the charging rate to be applied when calculating the price of calls over the respective calling distance. To calculate a price for a particular call of given calling distance and duration, firstly the appropriate tariff would be selected for the given calling distance, and secondly the charging rate defined for that tariff would be used to calculate the price for the call of given duration. Fortunately, a more conventional voice telephony product may comprise only two distance-related charging rates, one for local-rate calls of up to 56km and

one for national-rate calls of over 56km. Such a product requires only two tariffs to be defined in prior art tariff models. But it is clear that in prior art systems, modelling the tariffs for more complex products can entail either the definition and entry of a great many different tariffs with very similar descriptions, which slows down processing for billing runs and can be onerous both for initial data entry and for subsequent tariff revisions, or the imposition of an artificial simplification (or complication) of the charging structure for those products in order for the billing system to work. Having a great many similar tariffs can also complicate provisioning processes if users must select from large lists of tariffs with very similar descriptions, so increasing the likelihood of errors being made.

According to a first aspect of the present invention, there is provided an apparatus for determining a price for a product or service, comprising:

a tariff modelling component;

an input for receiving data defining an instance of the product or service to be priced; and

means for calculating the price of the defined instance of said product or service with reference to said tariff modelling component;

wherein, in use, said tariff modelling component is arranged to store a tariff model for the product or service, comprising:

(i) data defining a tariff space of at least one price-affecting tariff dimension;

(ii) a rating vector definition comprising at least one rating parameter for use in a pricing formula; and

(iii) data which defines regions in the tariff space over which said rating vector is invariant, and which defines a respective rating vector for each defined region;

and wherein said calculating means are arranged, on receipt of data defining an instance of the product or service to be priced, to identify a corresponding one of said defined regions and hence a respective rating vector, and to use the respective rating vector in said pricing formula to calculate a price for said instance of said product or service.

An apparatus according to this first aspect of the present invention provides a highly flexible tariff modelling arrangement, enabling tariff rules for complex

products or services to be modelled in a logical and straightforward manner. In comparison with prior art arrangements, the present apparatus simplifies the initial input of tariff data and the subsequent amendment both of tariffs and the tariff structure for a product or service. There are no inherent restrictions for example on the number of price-affecting tariff dimensions that can be modelled directly, so long as the price to be charged for an instance of a particular product can be defined in an arbitrarily complex function of those dimensions. The inherent flexibility of the tariff modelling arrangement according to preferred embodiments of the present invention enables product categories and associated tariffs to be defined from the perspective of ideal marketing strategy and greatest customer convenience rather than from the perspective of limitations in the corresponding billing system.

According to a second aspect of the present invention, there is provided a method of determining a price for a product or service, comprising:

(i) defining a tariff space of at least one price-affecting tariff dimension for said product or service;

(ii) defining a rating vector comprising at least one rating parameter for use in a pricing formula;

(iii) determining regions in the tariff space over which said rating vector is invariant;

(iv) for a specified instance of said product or service, identifying a corresponding one of said regions and hence the respective rating vector; and

(v) using the respective rating vector in said pricing formula to calculate a price for said specified instance of said product or service.

The method according to this second aspect of the present invention enables the modelling in data of the attributes that influence the price of a product. For any particular category of a product it is assumed that there will be a number of distinct attributes (known as "tariff dimensions" for the purposes of the present patent specification), the particular values of which not only distinguish an instance of that product category but are also sufficient to fully define the instance for pricing purposes. In practice, different categories of a product may be defined which, from a tariffing perspective, can each be dealt with as a single unit and the rules for pricing each category of the product would normally be identified in published price lists.

In general therefore, for a particular product category, the price is determinable on the basis of a series of n orthogonal tariff dimensions, the tariff dimensions defining an n-dimensional tariff space. In practice, the tariff dimensions do not need to be orthogonal, although selection of a non-orthogonal set of dimensions may lead to an unnecessary complicating of the tariff model. Formally, the price for a category of product is some function (F) of a vector D of tariff dimension values and a vector R of tariffing constants - the "rating" vector. By partitioning the tariff space into regions, additional flexibility exists in the selection of the rating vector. In particular, it is possible to define and store a different rating vector for each region.

When a price is to be determined for a particular instance of a product category, a vector D of tariff dimension values defining that instance of the product category is located within one of the pre-defined regions of the n-dimensional tariff space for that category and, having identified the containing region, the applicable rating vector R is identified. The identified rating vector R is then passed, together with the vector D of instance values, to a "plug-in" component comprising a pricing function for that product category arranged to combine the vectors according to an arbitrarily complex formula and to calculate a price for the particular instance of the product.

Applying embodiments of the present invention to the example of the voice telephony product mentioned above, there would be no difficulty in defining a single tariff for which the charging rate to be applied is a function of both the variable call duration and the variable calling distance. Furthermore, the calculating means may be arranged to apply a formula for calculating a price that includes not only the use-related (duration and distance) costs but also any fixed costs or price adjustments for the product to take account of tax or volume discounts, all on the basis of a single tariff definition. In addition, by making currency a dimension, it is possible to have "non-linked" price lists for different territories and to implement, for example, "price-pointing" simultaneously in each of those territories.

Prior art tariff models do not offer such a flexible capability. Furthermore, attempts to model some of the products provided by the present applicants using prior art billing platforms have to-date failed due to the intrinsic limitations of their respective tariff models.

According to a third aspect of the present invention, there is provided a method of generating a tariff model for a product or service, comprising the steps of defining, in said tariff model:

(i) at least one category of said product or service for which a common set of tariff rules apply;

(ii) a tariff space for said product or service defined in terms of a set of price-affecting tariff dimensions;

(iii) a pricing formula for use with said at least one category identified in step (i), said pricing formula being a function of at least one unspecified dimension and at least one rating parameter;

(iv) an association between said at least one unspecified dimension in said pricing formula and a tariff dimension for said at least one category;

(v) at least one region in said tariff space over which said at least one rating parameter is a constant; and

(vi) in respect of each said at least one region, the respective constant rating parameter values.

According to a fourth aspect of the present invention, there is provided a method for determining a price for an instance of a product or service with reference to a tariff model generated for said product or service by the method of said third aspect of the present invention, comprising the steps of:

(i) receiving data defining an instance of said product or service;

(ii) identifying a defined region in tariff space for said product or service containing the defined instance received at step (i);

(iii) identifying the at least one constant rating parameter value applicable to said identified region;

(iv) identifying the pricing formula to be applied to pricing instances of said product or service; and

(v) inputting said at least one constant rating parameter value and said received data defining said instance into said pricing formula to calculate a price for said instance.

In a preferred embodiment of the present invention, an eXtensible Markup Language (XML) interface is provided to enable updates to the tariff model to be defined in an XML data file and validated against a predefined Document Type

Definition (DTD), reducing the likelihood of errors arising through conventional data entry at a user interface. A definition and description of XML is published on the Internet by the Worldwide Web Consortium (W3C).

In general, where the term "product" is used in isolation in the present patent specification, it is intended to relate not only to a product as such, but also to a service or a technical entity for which tariffs or other rates are to be modelled.

Preferred embodiments of the present invention will now be described in detail, by way of example only, with reference to the accompanying drawings of which:

Figure 1 is a diagram showing the principal components of a known billing system;

Figure 2 is an entity relationship diagram for a tariff data model according to a preferred embodiment of the present invention;

Figure 3 is a flow diagram showing the principal steps in generating a tariff data model for a product or service, according to a preferred embodiment of the present invention;

Figure 4 is a flow diagram showing, in more detail, the steps in implementing step 310 of Figure 2, according to a preferred embodiment of the present invention;

Figure 5 is a flow diagram showing, in more detail, the steps in implementing step 315 of Figure 2, according to a preferred embodiment of the present invention; and

Figure 6 is a flow diagram showing a preferred process for determining a price for a product or service with reference to a tariff model for said product or service generated according to a preferred embodiment of the present invention.

Preferred embodiments of the present invention provide a particularly flexible tariff modelling arrangement suitable for use in many different systems in which a price must be determined for the rental and/or use of a product or service. Many of the known billing systems provide some form of tariff data model to store information relating to charging rates, but often with inherent inflexibilities making them unsuitable for modelling tariffs for more complex products and services. The tariff modelling arrangement according to preferred embodiments of the present invention may be used in place of a conventional tariff model in such billing systems, or it may

be integrated into an existing tariff model to make some or all of the resultant benefits of the present invention available in such systems.

Referring to Figure 1, a diagram is provided showing the basic components of a conventional billing system. A pricing engine 100 receives, by way of an input 105, details of billable instances of a product or service for which a price must be calculated and output 110. The pricing engine 100 refers to a tariff data model 115 to obtain details of the charging rate to be applied to each received billable instance (105). A user interface 120 or other form of interface is provided to enable updates to be made to the tariff model 115 and to provide an interface for querying the contents of the tariff model 115, e.g. for audit purposes.

TARIFF MODEL STRUCTURE

There will now be described a preferred tariff model according to a first embodiment of the present invention. The preferred tariff model will be described in general terms with reference an entity relationship diagram shown in Figure 2. While the entity relationship diagram of Figure 2 is intended to show all the main data entities in this preferred embodiment of the tariff model, certain data entities that are not essential to the modelling of tariffs for a particular product or service are omitted. For example, amongst data entities omitted are those defining the valid ranges for certain tariff dimensions, useful in particular to a pricing engine 100 for checking the validity of product or service instances to be priced. Also omitted from Figure 2 are entities and attributes that would be necessary if the preferred tariff model were used for products or services being offered simultaneously in more than one country and hence for which different language and currency attributes must be supported. For the purpose of describing this first preferred embodiment of the present invention, it is assumed that the tariff model will be used in respect of a single currency and language (English). Extensions to the tariff model to accommodate other languages will not be described further in the present patent specification as it would be clear to a person skilled in the field of database design to make any necessary additions to the preferred tariff model structure without further invention.

Referring to Figure 2, each entity of the preferred tariff model will now be described in turn, with a description of the attributes relevant to each entity and the implicit or explicit relationships between those entities. As is conventional in such

diagrams, where an explicit relationship is shown to exist between two entities, any attributes for effecting such a relationship are omitted from the respective attribute lists of the respective entities.

PRODUCT_CATEGORIES (200)

Product Categories are distinct categories of a product which, from a tariffing perspective, can be dealt with as a single unit. However, the particular choice of breakdown of a product into distinct categories need not be driven solely by tariffing considerations. The preferred tariff model provides sufficient flexibility in the modelling of tariffs to enable an ideal marketing breakdown for the product to also influence the choice of categories. However, it is intended that all instances of a product category share the same set of tariffing attributes and that all such instances are priced in the same consistent manner. The rules for pricing instances of a particular product category are normally communicated by the supplier to its customers through published price lists.

To enable the definition of each category for a given product or service, the preferred tariff model comprises a product category entity 200 having the following attributes:-

identifier	A unique identifier for the product category.
creation date	The date on which the product category is defined in the tariff model.
active date	The date from which the product category can first be used to create billable product instances.
inactive date	The date from which the product category can no longer be used to create product instances. Where a product category is still active, and no inactive date is known, a NULL value will be used here.

RATING_SCHEMES (205)

The rating scheme entity 205 provides for the definition of a general tariffing strategy based upon a knowledge of a set of price-affecting tariff dimensions and a set of tariff rates. A given rating scheme (205) may be used in determining prices for more than one different product category (200), but a particular product category (200) will use only one rating scheme (205). In practice an identifier for an applicable rating scheme (205) will be stored against each product category (200).

To enable the definition of one or more rating schemes that may be applied to products or services, the preferred tariff model further comprises a rating scheme entity 205 having the following attributes:-

identifier	An unique identifier for the rating scheme.
creation date	The date on which the rating scheme was defined in the tariff model.
number of dimensions	The number of tariff dimensions to be used by the rating scheme.
number of rates	The number of rating parameters to be used in each tariffing constants vector.

RATING_SCHEME_DIMENSIONS (210)

The rating scheme dimensions entity 210 provides for the definition of a set of tariff dimensions to be used in a particular rating scheme (205). This entity provides in an index attribute for use with each defined tariff dimension. As will become apparent from the description below, a pricing formula may comprise an arbitrarily complex function of one or more unspecified tariff dimensions each distinguished by an index value. The rating scheme dimensions entity 210 enables a specific tariff dimension to be associated with an otherwise unspecified dimension appearing in a pricing formula by assigning the same index value to the respective dimension index attribute.

A particular rating scheme (205) is based upon one or more rating scheme dimensions (210), but each defined rating scheme dimension (210) will be used in only one rating scheme (205). In practice, an identifier for a respective rating scheme (205) will be associated with a particular rating scheme dimension (210).

To enable the definition of one or more rating scheme dimensions for a particular rating scheme (205), the preferred tariff model further comprises a rating scheme dimension entity 210 having the following attributes:-

identifier	An identifier for the rating scheme dimension.
dimension index	The index value for the dimension (may correspond to an indexed dimension value in a pricing formula).

TEMPLATE_FORUMLAE (220)

The template formulae entity 220 provides for the definition of various predetermined pricing formulae that can be used as templates in creating a rating scheme (205) within the tariff model. Each template formula defined by this entity 220 may be used to price instances under one or more rating schemes (205). In practice therefore, an identifier for the applicable template formula (220) will be associated with particular rating scheme (205).

A template formula referenced by this entity is defined as an arbitrarily complex function of one or more tariff dimensions and one or more rating parameters. Each distinct tariff dimension and rating parameter used in a template formula is assigned a different index value, e.g. rating parameters r(0), r(1) and r(2), tariff dimensions dim(0) and dim(1). For convenience, the entity includes an optional, non-executable equation object to visually represent the template pricing formula implemented by the referenced function. Additional flexibility is provided within this template entity with the option to specify one of a number of different functions for implementing a particular template pricing formula in calculating a price for instances of a product.

To enable the definition of a template pricing formula for use by particular rating schemes (205), the preferred tariff model further comprises a template formulae entity 220 having the following attributes:-

identifier	A unique identifier for the template.
no_dimensions	The number of dimensions used algebraically in the underlying formula.

no_rates	The number of rates used by the underlying formula.
function	The identity of a predetermined function implementing the pricing formula.
creation_date	The date on which the template is created.
formula	An optional, non-executable equation object for visually defining the underlying template pricing formula.

PRODUCT_CATEGORY_BANDS (225)

The product category bands entity 225 provides for the definition of one or more regions ("bands") in the tariff space for a particular product category (200) over which a vector **R** (the "rating vector"), formed by values of the rating parameters in the applicable pricing formula (220), are constant. That is, all instances of the product category (200) falling within a particular product category band are priced using the same rating parameter values. For example, if there are three rating parameters r(0), r(1) and r(2) defined in a pricing formula, then the rating vector **R** is the vector formed by those three rating parameters, i.e. $\underline{R} = \{r(0), r(1), r(2)\}$, or more specifically, by the values those parameters take.

To enable the definition of one or more product category bands for a particular product category (200), the preferred tariff model further comprises a product category band entity 225 having the following attributes:-

identifier	An unique identifier for the band.
creation date	The date on which the band was defined in the tariff model.
active date	The date from which the band is to be considered active from a tariffing perspective.
inactive date	The date from which the band is to be considered inactive from a tariffing perspective.

PRODUCT_CATEGORY_BAND_SPEC (230)

The product category band specification entity 230 provides for the definition of the non-overlapping boundaries in the tariff space for a particular product category (200) of each defined product category band (225). The boundaries are defined in terms of ranges for one or more of the applicable tariff dimensions (see rating scheme dimensions (210)). In practice, with each product category band specification (230) there will be stored the index value for the corresponding rating scheme dimension (210) and an identifier for the respective product category band (225).

To enable the definition of the boundaries in tariff space for each defined product category band (225), the preferred tariff model further comprises a product category band specification entity 225 having the following attributes:-

identifier	The identity of a tariff dimension.
lower limit	The lower boundary value of the dimension for the band. The band defined by the lower_limit and the upper_limit are inclusive of the lower boundary value.
include upper limit	An indication of whether the upper limit should be considered inclusive or exclusive of the upper boundary value.
upper limit	The upper boundary value of the dimension for the band.

PRODUCT_CATEGORY_RATES (235)

This associative entity provides for the specification of a particular rating vector **R** to be applied in determining the price for instances of a particular product category (200) falling within the bounds of a particular product category band (225) and for a particular tariff period type (240 - see below).

To enable the definition of an applicable rating vector, the preferred tariff model further comprises a product category rates entity 235 having the following attributes:-

period_type	The type of period to which the rating vector relates.
product_category_ band identifier	The product category band to which the tariffing constants vector relates.
component identifier	The identity of a rating parameter component of the rating vector. For example, where there are 3 components to the rating vector **R**, then the components will be identified by the integers 0, 1 and 2.
value	The value of the identified component of the tariff rating vector.

TARIFF_PERIOD_TYPE (240)

Depending on the product being supplied, and whether it is supplied on a continuous or non-continuous basis, there may exist the requirement to associate multiple tariffs with a particular product category (200).

As an example, consider a service provided to a customer over some period of time, and for which a service charge is applied on a cyclic basis in advance of the customer receiving that service. It may be that contractually, the customer is committed to paying for that service on a quarterly basis, in which case the price list would publish the quarterly tariff. However, it may be that the service provider wishes to offer an annual charging cycle in addition to the quarterly cycle. Further, in order that the customer be provided with an incentive to pay for the service for a year in advance rather than a quarter in advance, the service provider sets an annual tariff which is less than four times the corresponding quarterly tariff. Hence the requirement to associate multiple tariffs (for different period types) with the same product category (200).

In any case, even where only a single tariff per product category (200) is to be recorded, it may be that different product categories (200) require tariffs for more than one cycle, and consequently knowledge of the cycle is required.

This complex relationship, involving the associative product category rates entity 235, defines the following:-

a product category rate (235) exists for a single product category band (225) for a single tariffing period type (240), and is one element of the rating vector $\underline{R}$ for that combination;

a product category band (225) may have multiple sets of product category rates (235); one for each period type (240).

To enable the definition of different tariff period types, the preferred tariff model further comprises a tariff period type entity 235 having the following attributes:-

identifier	An unique identifier used to represent the tariffing period type.

Having described the structure of a preferred tariff data model, preferred means for making updates to the model will now be described.

XML INTERFACE

In a preferred embodiment of the present invention, an eXtensible Markup Language (XML) interface is provided to enable updates to be made to the contents of a preferred tariff data model. The XML interface enables updates to be specified in an XML data file of a format defined according to a predetermined Document Type Definition (DTD). The DTD defines the permitted structure and syntax for XML data files specifically for use in updating the preferred tariff model. The XML interface comprises an XML file processor designed to interpret XML elements defined in the DTD and hence to process the contents of a submitted XML data file and to make updates to the respective parts of the preferred tariff data model. It is not necessary for users making updates to the preferred tariff data model to be aware of the actual structure of the model as the XML processor interprets the XML elements accordingly.

Preferably the XML interface provides users with a validating XML editor, designed to validate a user's input against the DTD and so preventing badly formed or invalid XML documents being submitted to the XML file processor.

TARIFF MODEL GENERATION

A preferred process will now be described, with reference to Figures 3, 4 and 5, for generating a tariff model (of the preferred type as described above with reference to Figure 2) for a product or service. The preferred process will firstly be described in general terms and secondly in the context of a worked example based upon the present applicant's Kilostream® product, a product designed to provide exclusive-use point-to-point data links with a choice of data transfer rates. More particularly, the worked example will demonstrate a use of the XML interface to the preferred tariff model, as described above, for entering data.

Referring to Figure 3, a flow diagram showing the main steps in operation of the preferred process, and additionally to Figure 2 in respect of the data entities involved at each step, the preferred process STARTs and at STEP 300 the most appropriate breakdown of categories (200) for a particular product or service is chosen. The choice of product categories (200) will typically take account not only of the tariff structure for the product or service, but also the way in which the product or service is to be marketed. At STEP 305 the price-affecting tariff dimensions for the product are identified and, if not already entered, may be defined in an optional extension to the tariff model. Such a definition for each price-affecting dimension preferably includes a name for the dimension, whether it is a continuous or a discrete entity and, if continuous, the range of values permitted. At STEP 310 the rating scheme (205) is defined for each category (200) of the product identified from STEP 300. Each rating scheme (205) defines the tariffs to be applied by a pricing engine 100 in calculating a price for instances of the product or service category (200). Finally, at STEP 315, each product category (200) identified from STEP 300 is formally defined within the tariff model.

The STEP 310 for defining the rating scheme (205) to be applied to each product category (200) itself comprises several steps as will now be described with reference to Figure 4. As was described above with reference to Figure 2, a rating scheme (205) may be defined in terms of a general pricing formula (220) and an association (210) between the unspecified tariff dimensions and rating parameters used in the formula (220) and the specific tariff dimensions and units of measurement for the respective product or service category (200).

Referring to Figure 4, and additionally to Figure 2, the first step in defining a rating scheme (205) is, at STEP 400, to enter top level details of the rating scheme (205), in particular to specify an identifier for the rating scheme, the number of tariff dimensions and the number of rating parameters to be used by the rating scheme (205). At STEP 405, an appropriate template formula (220) is selected, optionally from one of a number of predefined templates, having a pricing formula of the most appropriate structure given the tariff rules for the product or service. The pricing formula (220) will typically comprise an arbitrarily complex function of one or more unspecified tariff dimensions and one or more unspecified rating parameters. If an appropriate template formula (220) does not exist within the tariff model, a new template may be created at this stage. Creation of a new template is described in the worked example that follows this general discussion of the preferred process.

At STEP 410, the rating scheme tariff dimensions (210) are defined for the particular product or service, the number of tariff dimensions having been defined in the rating scheme details at STEP 400. The definition of each rating scheme tariff dimension (210) comprises an identifier for the dimension, each identifier corresponding to one of the specific tariff dimensions identified from STEP 300, and an index value for the dimension. If it is intended that the specific tariff dimension is to be used directly in the pricing formula, then the index value for that dimension is chosen to be the same as that of the appropriate unspecified tariff dimension in the template pricing formula (220), thereby creating an association between an unspecified tariff dimension in the template pricing formula (220) and a specific tariff dimension for the product or service. That completes the definition of the rating schemes (205) in the tariff model.

The STEP 315 for defining each of the product categories (200) identified from STEP 300 itself comprises several steps as will now be described with reference to Figure 5. As was described above with reference to Figure 2, a product category (200) may be defined in the tariff model and linked to an appropriate rating scheme (205). The tariff space defined by the identified tariff dimensions for the product category (200) may be divided into of one or more product category bands (225), each band defining a region (230) in the tariff space over which the vector **R** of rating parameter values in the rating scheme (205) is constant, and for each band (225) the applicable rating parameter vector **R**.

Referring to Figure 5, and additionally to Figure 2, the first step in defining a product category (200) in the tariff model is, STEP 500, to enter details (in particular, an identifier and status) of the product category (200), including an association with an appropriate rating scheme (205) as defined in STEP 310. At STEP 505, each of the (one or more) product category bands (225) is defined, each band representing a region in the tariff space of price-affecting tariff dimensions identified in STEP 305 over which a constant vector **R** of rating parameters is used in the respective rating scheme (205). Each product category band (225) is defined in terms of lower and upper bounds (230) for one or more of the tariff dimensions. For each defined band (225) the specific vector **R** of rating parameters (235) to be applied for pricing instances of the product category (200) falling within that region of tariff space is also defined and stored. If required, different rating vectors **R** may be stored for a particular band for each of a number of different tariff period types (240), as discussed above. This then completes the definition of a product category (200) in the tariff model.

WORKED EXAMPLE

The steps in operation of the preferred process described above with reference to Figures 3, 4 and 5 will now be described in the context of a specific product example, namely the applicant's Kilostream® product.

The following tariff table defines an example set of published annual rental tariffs for the Kilostream® product.

	Operative Date	Transmission Rate	
		Low Speed (2.4, 4.8 & 9.6 Kbit/s)	High Speed (19.2, 48 & 64 Kbit/s)
Each Local End	01.12.91	£800.00	£940.00
PLUS Main Link:			
- Both ends of Main Link in Central London Zone	01.12.91	£112.00	£112.00
- One or both ends outside Central London Zone:			
- For the first 15km, Per km or part		£112.00	£112.00
- Per additional km or part over 15km		£6.75	£6.75

From a review of the business rules implicit in this table, it is clear that the Kilostream® product is comprised of two types of component: Local-Ends and Main-Links. Although the price of a Local-End is independent of distance, the price of a Main-link can be a function of distance. In general, therefore, it is possible to define a general pricing formula for determining the annual price of a KiloStream® component as follows:-

Price = r(0) x distance + r(1)

where r(0) and r(1) are both appropriately selected constants.

In the case of a low-speed Local-end, the general pricing formula simplifies as follows, revealing values of r(0) = 0 and r(1) = 800:-

Price = 0 x distance + 800 = 800

Similarly in the case of a low-speed Main link with at least one end outside London and a length less than 15 Km, the general pricing formula simplifies as follows, revealing values of r(0) = 112 and r(1) = 0:-

Price = 112 x distance + 0 = 112 x distance

Finally in the case of a low-speed Main link with at least one end outside London and a length greater than 15 Km, the general pricing formula simplifies as follows, revealing values of r(0) = 6.75 and r(1) = 1578.75:-

Price = 6.75 x (distance – 15) + 15 x 112

= 6.75 x distance + 1578.75

Thus the same structure of pricing formula applies to both local-end and main links, whether the transmission rate is low speed or high speed. Therefore, for this product, at STEP 300 of Figure 3, it is identified that a single product category (200) will suffice for modelling tariffs in the preferred tariff model.

Having identified the product category (200) appropriate for the product, the next step, STEP 305, is to identify and define the price-affecting tariff dimensions for the product. For the Kilostream® product the price-affecting tariff dimensions are clearly component, length, speed, and zone. However, a fifth dimension of currency may also be defined, as will be seen below, enabling separate and independent price lists to be maintained if required.

The component dimension (called Kcomponent in this example) is to be defined as a textual dimension with the values 'Local-End' and 'Main-Link'.

The length dimension (called Klength in this example) is to be defined as a continuous numeric dimension in the range 0 to infinity.

The speed dimension (called Kspeed in this example) is to be defined as a discrete numeric dimension with the values 2.4, 4.8, 9.6, 48 and 64 Kbit/s.

The zone dimension (called Kzone in our example) is to be defined as a discrete textual dimension with the values "City of London" and "Other".

In practice, the step (305) of identifying tariff dimensions for a product takes place at the same time as the step (300) of identifying the breakdown of product categories (200). However, at STEP 305, the defined price-affecting tariff dimensions may now be entered into an appropriate database, optionally an extension to the preferred tariff model structure, if not entered already. As was noted above, entities for storing information defining the valid ranges of tariff dimensions are not shown in the entity relationship diagram in Figure 2 as this information is not essential to the preferred tariff model itself. However, for completeness, an example of an XML data file for defining the tariff dimensions for the Kilostream® product example is as follows:

```
<?xml version="1.0"?>
<!DOCTYPE dbt SYSTEM "http://glossi.nat.bt.com/DTD/dbt.dtd">
<dbt language="English" date_format="dd-mm-yyyy">

    <domains>

            <!--
                 Delete the domains first so that it is possible to
                 process the document multiple times
            -->

            <domain name="Kcomponent" function="delete"/>

            <domain name="Kcomponent" type="text" size="10"
                    units="component"
                    start="today" stop="indefinite">
                <point value="Main-Link"/>
                <point value="Local-End"/>
            </domain>

            <domain name="Klength" function="delete"/>

            <domain name="Klength" type="numeric"
                    subtype="continuous" size="10.02" units="Km"
                    start="today" stop="indefinite">
                <range lower="0" upper="infinite"/>
            </domain>

            <domain name="Kspeed" function="delete"/>

            <domain name="Kspeed" type="numeric"
                    subtype="discrete" size="3.01"
                    units="Kbit/s"
                    start="today" stop="indefinite">
                <point value="2.4"/>
                <point value="4.8"/>
                <point value="9.6"/>
                <point value="19.2"/>
                <point value="48"/>
                <point value="64"/>
            </domain>

            <domain name="Kzone" function="delete"/>

            <domain name="Kzone" type="text" size="20"
                   units="Zone" start="today" stop="indefinite">
                <point value="City of London"/>
                <point value="Other"/>
            </domain>

    </domains>

</dbt>
```

Although, as stated above, it is assumed that only one language will be supported in the preferred tariff model for the purpose of describing preferred embodiments of the present invention, it will be noted that the XML file above includes a language attribute providing a document-level definition of the language in which text attributes are to be interpreted, in this case "English".

The date_format attribute is used to select a date format in which subsequent dates appearing in the document are to be interpreted. Preferably, only a limited set of formats are supported. The format specified in the XML file above is interpreted as a 2-digit day number, followed by a '-', followed by a 2-digit month number, followed by another '-' followed by a 4-digit year number.

Note, firstly, that the "domain" element used here is a different entity to "dimension". Domains relate to the legal and permissible values for particular "measured" quantities. For example, distance values must be positive integers. A Kilostream® circuit component type can have only the values "Main Link" or "Local End". Thus domains define a spectrum of possible values, whereas dimensions are drawn from particular domains. Thus domains are all about data validation and are not essential components of the tariff model itself. However, the XML processor 135 is arranged to recognise the domain element and to store these data in an extension to the preferred tariff model or separately from the tariff model itself, if required.

Note, further, that in the XML file above, the "type", "subtype" and "size" attributes of the domain element for Kcomponent define the Kcomponent domain to be a textual domain of size 10 characters. Further, note that the valid domain values are specified as a series of point sub-elements.

For the Klength domain, the "type", "subtype" and "size" attributes of the domain element define it to be a continuous numeric domain of 10 digits with a precision of 2 decimal places. Further, note that the range for this domain is specified via the single range sub-element.

For the Kspeed domain, the "type", "subtype" and "size" attributes of the domain element define it to be a discrete numeric domain with 3 digits and with a precision of 1 decimal place. Further, note how in this case, it is the point sub-elements that define the legal discrete domain values.

For the Kzone domain, the "type", "subtype" and "size" attributes of the domain element define it to be a textual domain of size 20 characters. Further, note that the legal domain values are specified via a series of point sub-elements.

Having defined the price-affecting tariff dimensions for the product, the next step, STEP 310, is to define the appropriate rating scheme (205). This step comprises, firstly, STEP 400 of Figure 4, to enter top level details of the rating scheme (205) as defined for the rating scheme entity (205) described above with

reference to Figure 2. The next step, STEP 405, is to select the appropriate template formula (220) for the product. For the Kilostream® product, the general pricing formula was identified as being of the form

Price = r(0) x distance + r(1)

where r(0) and r(1) are both appropriately selected constants. If a predefined template (220) exists in the tariff model having a pricing formula of this form, then it may be linked at this step to the rating scheme (205). However, if no pricing formula of the correct format is available, then a new template may be created at this stage, corresponding in detail to the entity (220) described above with reference to Figure 2. For completeness, an example of an XML data file that may be used to generate the appropriate template is as follows. For convenience, this XML data file causes the entry into the tariff model of both the rating scheme attributes (205) from STEP 400 and the template pricing formula from STEP 405 in one XML data file.

```
<?xml version="1.0"?>
<!DOCTYPE dbt SYSTEM "http://glossi.nat.bt.com/DTD/dbt.dtd">
<dbt language="English" date_format="dd-mm-yyyy">
    <templates>

        <!--
            Delete the template so that the it is possible to
                process the document multiple times
        -->

        <template name="MyLinear" function="delete"/>

        <template name="MyLinear" rates="2"
                  dimensions="1"
                  function.tariff="MyLinear.calc">

            <header>
                CREATE OR REPLACE PACKAGE MyLinear
                IS
                    FUNCTION calc Return DBT.tariff_t;
                    PRAGMA RESTRICT_REFERENCES (calc, WNDS, WNPS);
                End MyLinear;
            </header>
            <body>
                CREATE OR REPLACE PACKAGE BODY MyLinear
                IS
                    FUNCTION calc Return DBT.tariff_t
                    Is
                    dims DBT.dimension_vector_t;
                    rates DBT.rate_vector_t;
                    BEGIN
                        DBT_Tariff.get_dimensions(dims);
                        DBT_Tariff.get_rates(rates);
                    return( rates(0)*dims(0) + rates(1) );
                    end;
                End MyLinear;
            </body>
        </template>
    </templates>
</dbt>
```

In order to be able to process the XML file multiple times, the first <template> element represents an instruction to delete any existing template with the name "MyLinear" (the attribute function="delete" defines this). Where no such template exists, as in the case when the XML document is processed for the first time, no error is generated, thus making the document truly re-runable.

The second <template> element in the above XML file specifies the name of the template ("MyLinear" in this example) and the number of rating parameters (in the rates vector) and dimensions to be used in the rating scheme (205). The number of rates is 2, since the general pricing formula being defined uses rating parameters r(0) and r(1). Similarly, there is only a single dimension in this formula (later to be defined as distance).

Finally, the header and body elements identify (in the template attribute function.tariff) a process (MyLinear.calc) that implements the template pricing formula defined to calculate a price for instances of the product category (200).

The next step in the preferred process is, STEP 410, to define the rating scheme dimensions (210) for the rating scheme (205). An example of an XML data file designed to input these data for the Kilostream® product is as follows:

```
<?xml version="1.0"?>
<!DOCTYPE dbt SYSTEM "http://glossi.nat.bt.com/DTD/dbt.dtd">
<dbt language="English" date_format="dd-mm-yyyy">

    <rating_schemes>
            <!--
                Delete the schemes first so that it is possible to
                process the document multiple times
            -->
            <rating_scheme name="Krating" function="delete"/>

            <rating_scheme name="Krating" template="MyLinear"
                           start="today" stop="indefinite">

                <domain_mapping name="Klength" index="0"/>
                <domain_mapping name="Kspeed" index="1"/>
                <domain_mapping name="Kcomponent" index="2"/>
                <domain_mapping name="Kzone" index="3"/>
                <domain_mapping name="Currency" index="4"/>

                <rate name="Cost per Kilometre"
                      units="Currency/Kilometre" index="0"/>
                <rate name="Fixed Cost"
                      units="Currency" index="1"/>

            </rating_scheme>

    </rating_schemes>

</dbt>
```

The second rating_scheme element creates a new rating scheme (205) based upon the previously selected, or created, template (220) "MyLinear". By means of a series of domain_mapping elements, the four previously created domains (tariff dimensions defined at STEP 305) Klength, Kspeed, Kcomponent and Kzone – rating scheme dimensions (210) - are added to the rating scheme (205). Similarly, a pre-defined dimension Currency is also added. Being on index 0, it is the Klength dimension that will be used in the MyLinear template formula (220), defined earlier.

Optionally, the rate elements may be used to define the names of the two rates inherited from the underlying template formula (220), MyLinear, and their respective units of measurement, although these data are not essential to the contents of the preferred tariff model.

Having defined the rating scheme (205) at STEP 310, the final stage is, STEP 315, to formally define the product category in the tariff model for the Kilostream® product. To achieve this, the first step, STEP 500 of Figure 5, is to enter top-level details of the product category as defined for the entity (200) described above with reference to Figure 2, together with a reference to the rating scheme (205) to be used in pricing instances of this product category. The next steps, STEP 505 and 510 define the regions (product category bands (225)) of Kilostream® product tariff space in which the rating parameters are constant, and to store the respective rating parameter values for each region. An example of an XML data file designed to implement each of the process steps in Figure 5 for the Kilostream® product is as follows:

```
<?xml version="1.0"?>
<!DOCTYPE dbt SYSTEM "http://glossi.nat.bt.com/DTD/dbt.dtd">
<dbt language="English" date_format="dd-mm-yyyy">

    <product_categories>

            <!--
                Delete the product category first so that it is
                  possible to process the document multiple times
            -->

            <product_category name="KiloStream"
                              function="delete"/>

            <product_category name="KiloStream"
             rating_scheme="Krating" code="D000nn"
             type="recurring"
             GL.0="L2Code" GL.1="L2Code"
```

```
start="01-12-1991" function="new">

    <!--
       Low-speed, Local-End
    -->

    <band start="01-12-1991" stop="indefinite">
        <band_definition>
            <dimension.spec index="0" name="Klength"
                 lower="0" upper="infinite"/>
            <dimension.spec index="1" name="Kspeed"
                 lower="2.4" upper="9.6"/>
            <dimension.spec index="2"
               name="Kcomponent" value="Local-End"/>
            <dimension.spec index="3" name="Kzone"/>
            <dimension.spec index="4"
                name="Currency" value="GBP"/>
        </band_definition>
        <rates_definition period="Annual">
           <rate.spec index="0" value="0"/>
           <rate.spec index="1" value="800"/>
        </rates_definition>
    </band>

    <!--
       High-speed, Local-End
    -->

    <band start="01-12-1991" stop="indefinite">
        <band_definition>
            <dimension.spec index="0" name="Klength"
                 lower="0" upper="infinite"/>
            <dimension.spec index="1" name="Kspeed"
                 lower="19.2" upper="64"/>
            <dimension.spec index="2"
               name="Kcomponent" value="Local-End"/>
            <dimension.spec index="3" name="Kzone"/>
            <dimension.spec index="4"
               name="Currency" value="GBP"/>
        </band_definition>
        <rates_definition period="Annual">
           <rate.spec index="0" value="0"/>
           <rate.spec index="1" value="940"/>
        </rates_definition>
    </band>


    <!--
       City-of-London Main-Link
    -->

    <band start="01-12-1991" stop="indefinite">
        <band_definition>
            <dimension.spec index="0" name="Klength"
               lower="0" upper="infinite"/>
            <dimension.spec index="1" name="Kspeed"
               lower="2.4" upper="64"/>
            <dimension.spec index="2"
               name="Kcomponent" value="Main-Link"/>
            <dimension.spec index="3" name="Kzone"
               value="City of London"/>
            <dimension.spec index="4"
               name="Currency" value="GBP"/>
        </band_definition>
        <rates_definition period="Annual">
           <rate.spec index="0" value="0"/>
           <rate.spec index="1" value="112"/>
        </rates_definition>
    </band>

    <!--
       Non-City-of-London Main-Link, <15 Km
    -->
```

```
                <band start="01-12-1991" stop="indefinite">
                    <band_definition>
                        <dimension.spec index="0" name="Klength"
                           lower="0" upper="15"/>
                        <dimension.spec index="1" name="Kspeed"
                           lower="2.4" upper="64"/>
                        <dimension.spec index="2"
                           name="Kcomponent" value="Main-Link"/>
                        <dimension.spec index="3" name="Kzone"
                           value="Other"/>
                        <dimension.spec index="4"
                           name="Currency" value="GBP"/>
                    </band_definition>
                    <rates_definition period="Annual">
                       <rate.spec index="0" value="112"/>
                       <rate.spec index="1" value="0"/>
                    </rates_definition>
                </band>


                <!--
                   Non-City-of-London Main-Link, >15 Km
                -->

                <band start="01-12-1991" stop="indefinite">
                    <band_definition>
                        <dimension.spec index="0" name="Klength"
                           lower="15" upper="infinite"/>
                        <dimension.spec index="1" name="Kspeed"
                           lower="2.4" upper="64"/>
                        <dimension.spec index="2"
                           name="Kcomponent" value="Main-Link"/>
                        <dimension.spec index="3" name="Kzone"
                           value="Other"/>
                        <dimension.spec index="4"
                           name="Currency" value="GBP"/>
                    </band_definition>
                    <rates_definition period="Annual">
                       <rate.spec index="0" value="6.75"/>
                       <rate.spec index="1" value="1578.75"/>
                    </rates_definition>
                </band>

            </product_category>

    </product_categories>

</dbt>
```

The main element in this XML file is the "product_category" element that defines the name for the "KiloStream" product category (205). This element includes the key attributes of "rating_scheme", which references the applicable rating scheme (205) and hence the underlying pricing formula (220), and "type" which defines (tariff period type (240)) the charge to be recurring in nature.

Contained within this "product_category" element are the five key definitional blocks, consistent with the five sub-categories of tariff shown in the Kilostream® product tariff table shown above. These are:-

Low-speed Local-Ends (2.4, 4.8 & 9.6 Kbit/s);

High-speed Local-Ends (19.2, 48,& 64 Kbit/s);

City-of-London Main-Link;

Non-City-of-London Main-Link less than 15 Km; and

Non-City-of-London Main-Link greater than 15 Km

Each of these sub-categories is represented as a "band" element containing "band_definition" (225) and "rates_definition" (235) elements. The "band" element defines (225) the start and end dates by means of "start" and "stop" attributes. Where there is no scheduled stop date, the band is created "open" by setting the "stop" attribute to "indefinite".

The "band_definition" element is used to define a tariffing band (230). This is achieved using a series of "dimension.spec" elements, each of which identifies a range or value for the underlying tariff dimension. Generally, for discrete-valued dimensions, the "value" attribute is used to define the required dimension range, whilst for a continuous numeric dimension, the "lower" and "upper" attributes of the "dimension.spec" element are used. For discrete numeric dimensions it is also possible to use the "lower" and "upper" attributes instead of the "value" attribute in order to cover a range of values (e.g. for Kspeed it is possible to use the attribute pair lower="2.4" upper="9.6"). Where none of the "value", "lower" or "upper" attributes are specified, then the range of the associated dimension is said to be wholly open. Note that it is even possible to specify a textual dimension to be wholly open in this way.

The "rates_definition" element defines, for each band (225), the rating vector $\underline{R}$ comprised of the constant values for the rating parameters (235) associated with the underlying rating scheme (205) for that band (225), e.g. for the "City-of-London Main-Link" band, the applicable rating vector $\underline{R} = (0,112)$.

PRICING PROCESS

With the tariff data entered into the preferred tariff model, a pricing engine may be arranged to interrogate the model to obtain all the information necessary to calculate a price for specific instances of the product. In a further preferred embodiment of the present invention, a pricing process will now be described with reference to Figure 6 for determining the price for an instance of a specific product with reference to a preferred tariff model, as described above with reference to

Figure 2, for that product. In a typical implementation, a pricing engine 100 of Figure 1 may be arranged to operate the pricing process of Figure 6 in cooperation with a tariff modelling component 115 arranged to implement the preferred tariff model of Figure 2.

Referring to Figure 6, the pricing process begins with, at STEP 600, receipt of a vector **D** of tariff dimension values for an instance of a specified product. It is assumed that if more than one category of the product has been defined, that the relevant category for the received instance of the product is identifiable. In a typical implementation of a billing system incorporating a preferred tariff model and pricing process according to preferred embodiments of the present invention, a file containing a substantial number of defined instances may be input at STEP 600 as the input to a bulk billing run. At STEP 605, each input vector **D** is preferably validated with reference to a database of defined ranges for each component tariff dimension (see the worked example above for a description of the storage of data defining "domains"), although alternatively a validation step may be carried out on the instances data prior to receipt at STEP 600.

At STEP 610, the pricing process accesses the preferred tariff model to identify which of the defined product category bands (225) contain the received instance vector **D**. The particular product category band (225) may be identified for example by making a dimension-by-dimension comparison of the respective instance value with the corresponding range definition (230) for each product category band (225) until a band is identified for which every dimension instance value in the vector **D** lies within the respective dimension range for that band.

At STEP 615, having identified the relevant product category band (225), the pricing process reads from the tariff model the corresponding rates vector **R** for that band (225) and, at STEP 620, identifies the applicable rating scheme (205) for the product category (200) and hence the pricing formula to be applied in calculating the price for the instance **D**.

At STEP 625, the pricing engine inputs the vectors **D** and **R** into the pricing formula to calculate and output a price for the input instance **D**. This process may then be repeated for each instance of the product or service input at STEP 600, if more than one.

IMPLEMENTATION

While the present applicants have implemented the preferred tariff model by integrating the data entities into an existing billing system tariff database, any of a number of different known database management systems may be used to implement the preferred tariff model either as a stand-alone database or integrated with an existing model, as would be apparent to a person skilled in the field of database design. For example, the preferred tariff model may be implemented in a straightforward manner using a relational database management system such as ORACLE®. Further implementation detail will not therefore be provided in the present patent specification.

FURTHER APPLICATIONS OF THE PRESENT INVENTION

As was mentioned in the introductory part of the present patent specification, preferred embodiments of the present invention may be applied to the modelling of rate information for other than telecommunications-related products or services. For example, in banking, interest rates payable on certain types of account may vary according to account balance, notice period for withdrawals, whether online or conventionally managed, etc. Modelling techniques used in generating a tariff model according to preferred embodiments of the present invention may be readily applied to the modelling of interest rates for banking products. Furthermore, embodiments of the present invention may be used in modelling any form of rate, whether or not the rates and the corresponding "pricing" formula applicable to a particular instance of a set of dimensions have any relation to the calculation of "prices" or other quantities in a financial context.

CLAIMS

1. An apparatus for determining a price for a product or service, comprising:

a tariff modelling component (115);

an input (105) for receiving data defining an instance of the product or service to be priced; and

means (100) for calculating the price of the defined instance of said product or service with reference to said tariff modelling component (115);

wherein, in use, said tariff modelling component (115) is arranged to store a tariff model for the product or service, comprising:

(i) data (210) defining a tariff space of at least one price-affecting tariff dimension;

(ii) a rating vector definition comprising at least one rating parameter for use in a pricing formula (220); and

(iii) data (230) which defines regions in the tariff space over which said rating vector is invariant, and which defines the respective rating vector (235) for each defined region;

and wherein said calculating means (100) are arranged, on receipt of data defining an instance of the product or service to be priced, to identify a corresponding one of said defined regions (230) and hence a respective rating vector (235), and to use the respective rating vector (235) in said pricing formula (220) to calculate a price for said instance of said product or service.

2. An apparatus according to Claim 1, wherein in (i) said tariff space is defined in terms of an orthogonal set of price-affecting tariff dimensions for said product or service.

3. An apparatus according to Claim 1 or Claim 2, further comprising an interface (120) to said tariff modelling component (115) for processing data received at said interface and for making corresponding updates to said tariff model, wherein said received data are formatted according to a pre-defined markup language and wherein different data elements of said pre-defined mark-up language relate to different entities within said tariff model.

4. An apparatus according to Claim 3, wherein said predefined markup language is defined according to the extensible markup language standard.

5. A method of determining a price for a product or service, comprising:

(i) defining a tariff space (210) of at least one price-affecting tariff dimension for said product or service;

(ii) defining a rating vector comprising at least one rating parameter for use in a pricing formula (220);

(iii) determining regions (230) in the tariff space over which said rating vector is invariant;

(iv) for a specified instance of said product or service, identifying a corresponding one of said regions (230) and hence the respective rating vector (235); and

(v) using the respective rating vector (235) in said pricing formula (220) to calculate a price for said specified instance of said product or service.

6. A method according to Claim 5, wherein at step (i) said tariff space (210) is defined in terms of an orthogonal set of price-affecting tariff dimensions for said product or service.

7. A method of generating a tariff model for a product or service, comprising the steps of defining, in said tariff model:

(i) at least one category (200) of said product or service for which a common set of tariff rules apply;

(ii) a tariff space (210) for said product or service defined in terms of a set of price-affecting tariff dimensions;

(iii) a pricing formula (220) for use with said at least one category (200) identified in step (i), said pricing formula (220) being a function of at least one unspecified dimension and at least one rating parameter;

(iv) an association (210) between said at least one unspecified dimension in said pricing formula (220) and a tariff dimension for said at least one category (220);

(v) at least one region (225, 230) in said tariff space over which said at least one rating parameter is a constant; and

(vi) in respect of each said at least one region, the respective constant rating parameter values (235).

8. A method for determining a price for an instance of a product or service with reference to a tariff model generated for said product or service by the method of Claim 7, comprising the steps of:

(i) receiving (105) data defining an instance of said product or service;

(ii) identifying a defined region (230) in tariff space for said product or service containing the defined instance received (105) at step (i);

(iii) identifying the at least one constant rating parameter value (235) applicable to said identified region (235);

(iv) identifying the pricing formula (220) to be applied to pricing instances of said product or service; and

(v) inputting said at least one constant rating parameter value (235) and said received (105) data defining said instance into said pricing formula (220) to calculate (100) a price for said instance.

ABSTRACT

TARIFF MODELLING

A method and apparatus are provided for generating a tariff model 115 for use in determining a price for an instance of a product or service. A method and apparatus are also provided for determining a price for a product or service with reference to a tariff model 115 generated according to preferred embodiments of the present invention. The preferred tariff model comprises:

(i) data (210) defining a tariff space of at least one price-affecting tariff dimension;

(ii) a rating vector definition comprising at least one rating parameter for use in a pricing formula (220); and

(iii) data (230) which defines regions in the tariff space over which said rating vector is invariant, and which defines the respective rating vector (235) for each defined region.

A price for a product or service instance is determined by identifying a defined region (230) containing the instance and hence the constant rating parameter values (235) (the applicable rating vector) to be used in a pricing formula (220) to calculate a price for the instance.

Figure (2)

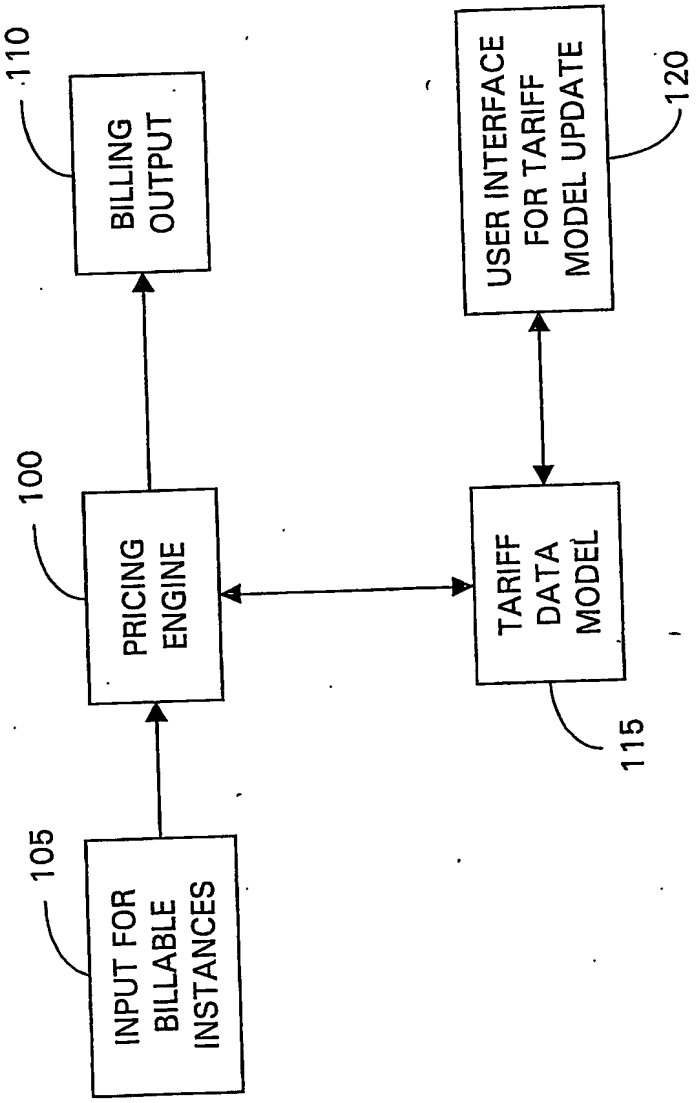
110
BILLING OUTPUT
120
USER INTERFACE FOR TARIFF MODEL UPDATE
100
PRICING ENGINE
TARIFF DATA MODEL
115
105
INPUT FOR BILLABLE INSTANCES

Figure 1

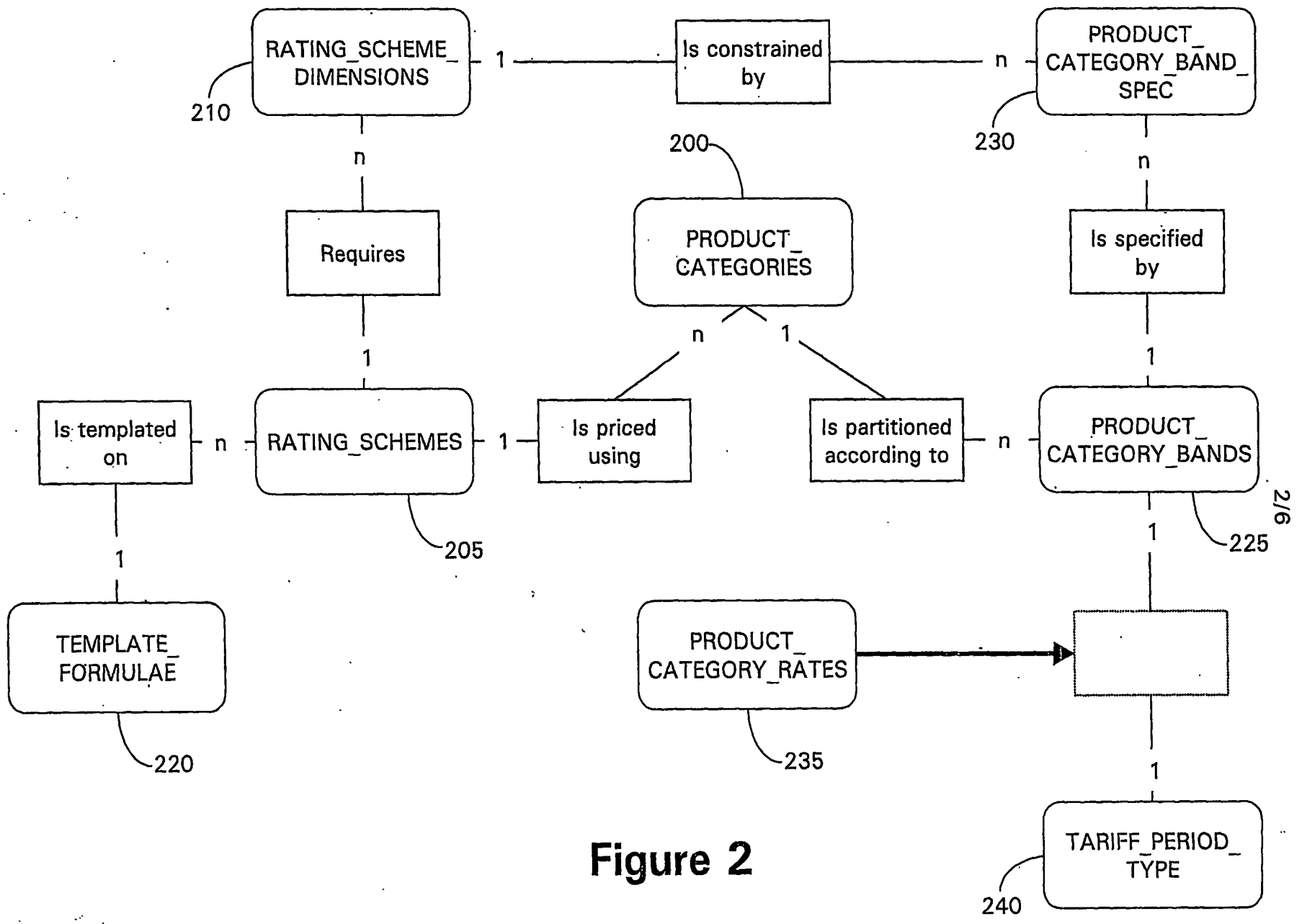
RATING_SCHEME_ DIMENSIONS
210
1
Is constrained by
n
PRODUCT_ CATEGORY_BAND_ SPEC
230
n
Requires
1
200
PRODUCT_ CATEGORIES
n
1
Is specified by
1
Is templated on
n
RATING_SCHEMES
205
1
Is priced using
Is partitioned according to
n
PRODUCT_ CATEGORY_BANDS
225
1
1
TEMPLATE_ FORMULAE
220
PRODUCT_ CATEGORY_RATES
235
1
TARIFF_PERIOD_ TYPE
240

Figure 2

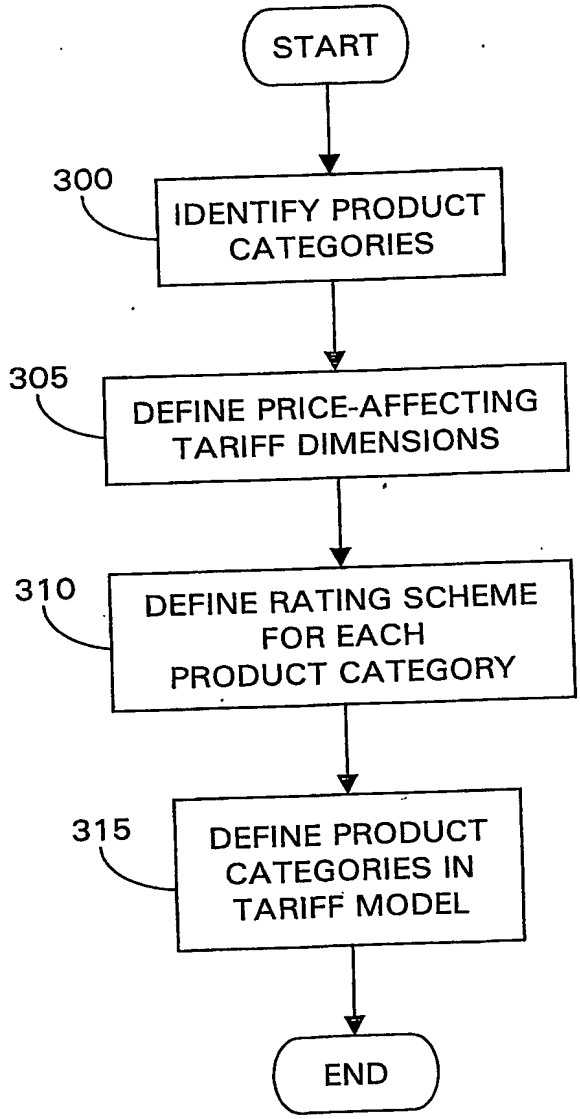
START
300
IDENTIFY PRODUCT CATEGORIES
305
DEFINE PRICE-AFFECTING TARIFF DIMENSIONS
310
DEFINE RATING SCHEME FOR EACH PRODUCT CATEGORY
315
DEFINE PRODUCT CATEGORIES IN TARIFF MODEL
END

Figure 3

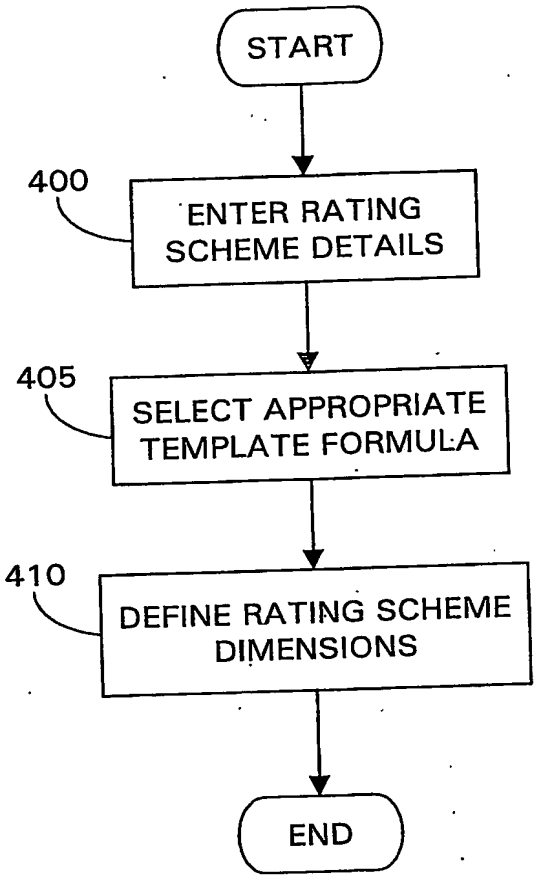
START
400
ENTER RATING SCHEME DETAILS
405
SELECT APPROPRIATE TEMPLATE FORMULA
410
DEFINE RATING SCHEME DIMENSIONS
END

Figure 4

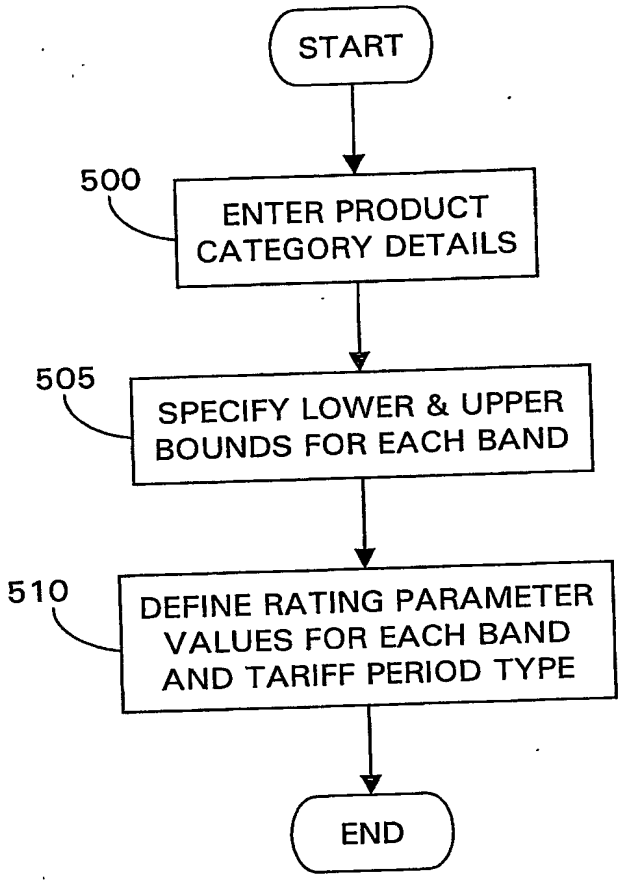
START
500
ENTER PRODUCT CATEGORY DETAILS
505
SPECIFY LOWER & UPPER BOUNDS FOR EACH BAND
510
DEFINE RATING PARAMETER VALUES FOR EACH BAND AND TARIFF PERIOD TYPE
END

Figure 5

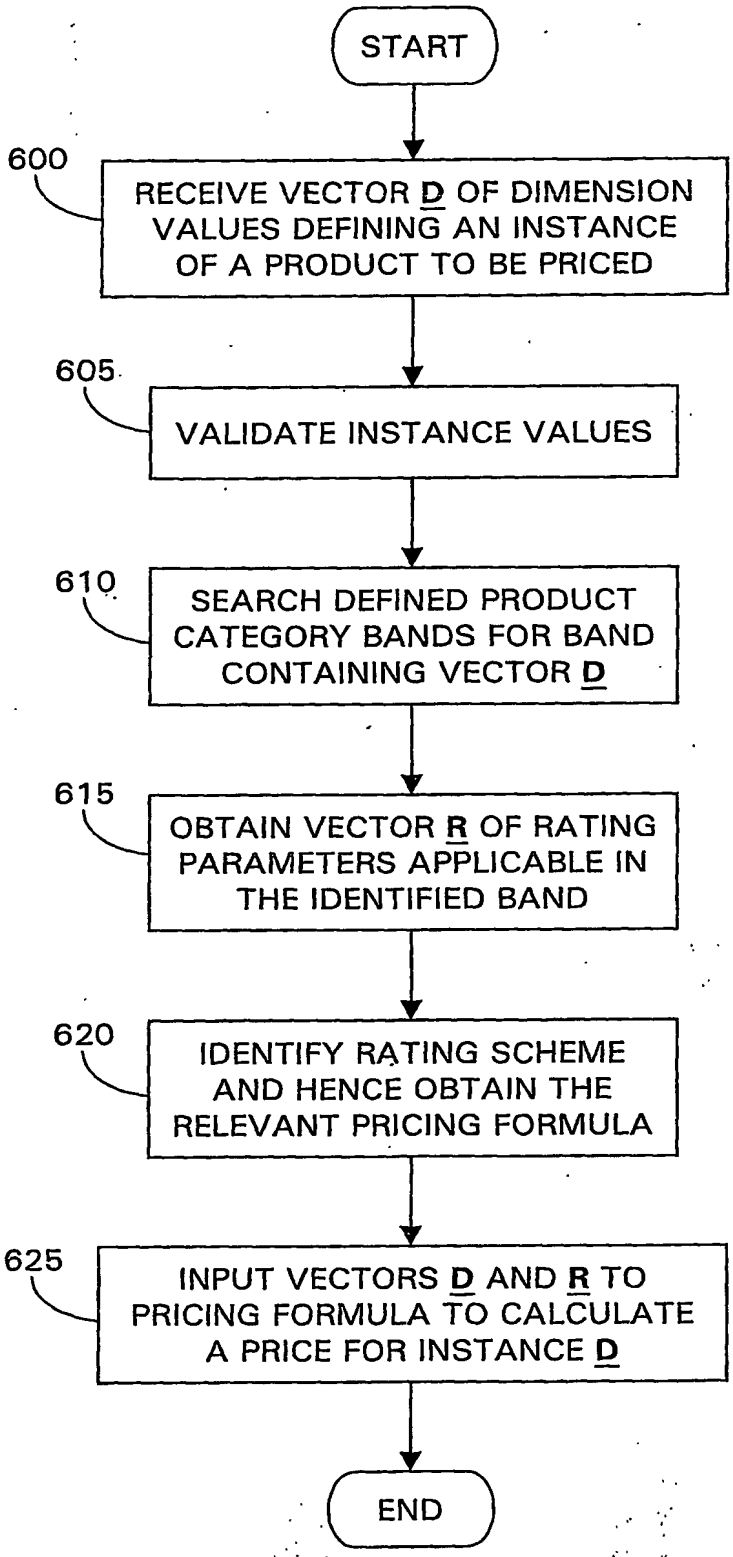
START
600
RECEIVE VECTOR D OF DIMENSION VALUES DEFINING AN INSTANCE OF A PRODUCT TO BE PRICED
605
VALIDATE INSTANCE VALUES
610
SEARCH DEFINED PRODUCT CATEGORY BANDS FOR BAND CONTAINING VECTOR D
615
OBTAIN VECTOR R OF RATING PARAMETERS APPLICABLE IN THE IDENTIFIED BAND
620
IDENTIFY RATING SCHEME AND HENCE OBTAIN THE RELEVANT PRICING FORMULA
625
INPUT VECTORS D AND R TO PRICING FORMULA TO CALCULATE A PRICE FOR INSTANCE D
END

Figure 6

PCT Application
GB0304958

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